ИМКЭС
СО РАН

INSTITUTE OF MONITORING
OF CLIMATIC AND ECOLOGICAL SYSTEM

SIBERIAN BRANCH OF THE RUSSIAN ACADEMY OF SCIENCE

The influence of heat fluxes over the Arctic Ocean the temperature conditions over the North Eurasia

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Anomalies of average global air temperature

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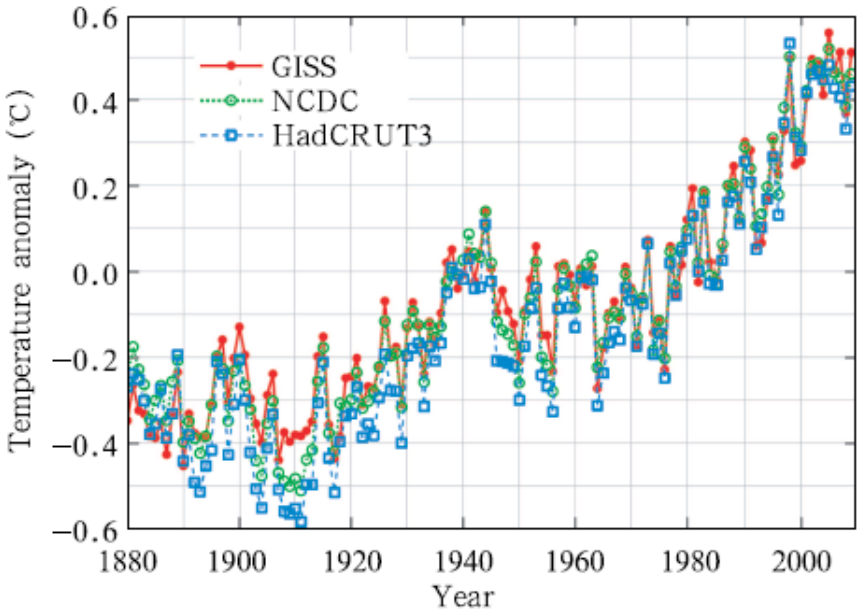

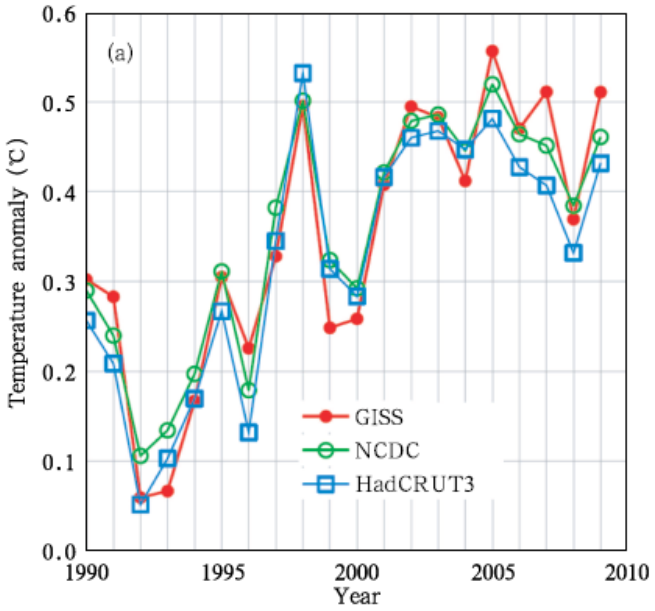

Anomalies of average global sea surface temperature

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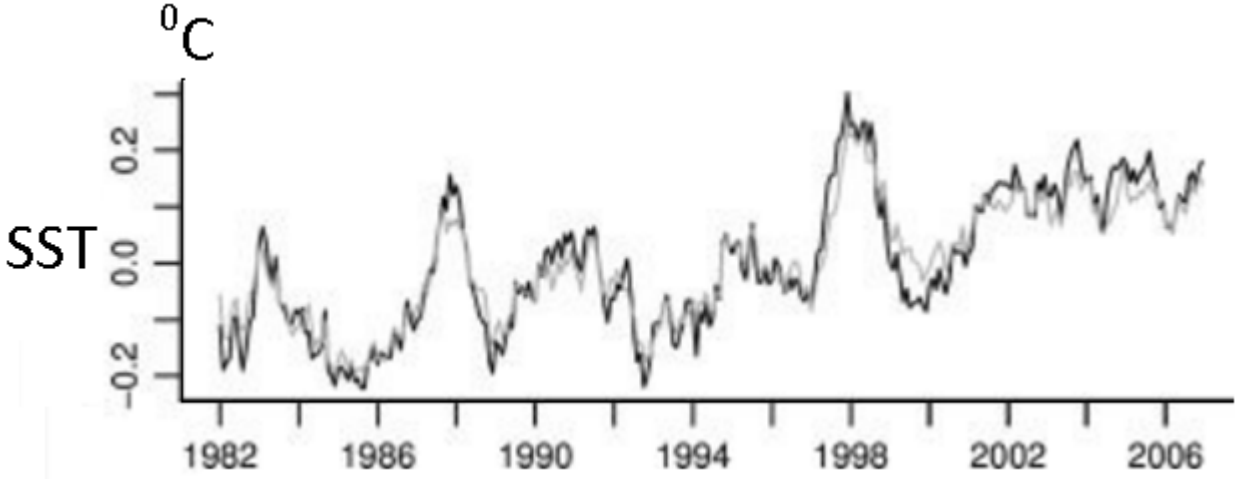


* X. Wen, G. Tang, S. Wang, J. Huang (2011)

* *Susana M. Barbosa, Ole B. Andersen (2009)

Deser C.(1993r), Blastoch A.(2008r), Polonsky O.M. (2005r)

The ocean-atmosphere interaction in the Arctic Ocean

The change of sea surface temperature

The change of heat fluxes

The impact on circulation and cloudiness

The change of ice concentration

The purpose of investigation

Investigation of temporal and spatial variability of the heat fluxes on the ocean-atmosphere boundary over the Arctic seas, and estimate of their relationship with the temperature regime over the North Eurasia for the periods of 1979 – 2012 and 2000 - 2012

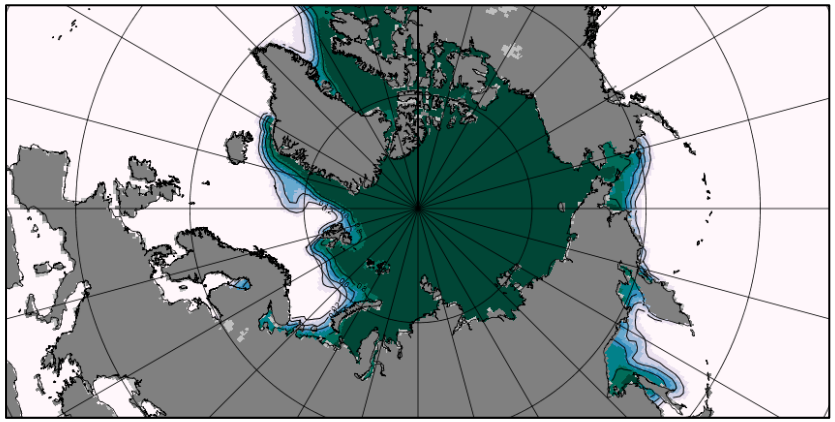
Investigated values

Database	Data type	Period	Investigated values
JRA-55	Reanalysis	1958 – 2014 rr.	**Temp** – air temperature (2 m) over the Eurasia
NOAA	Model calculations	1900 – 2012 rr.	**SST** – sea surface temperature **ice** – ice concentration
OAFLUX	Model calculations + satellite observations	1958 - 2013 rr.	**LE** – latent heat flux **S** - sensible heat flux

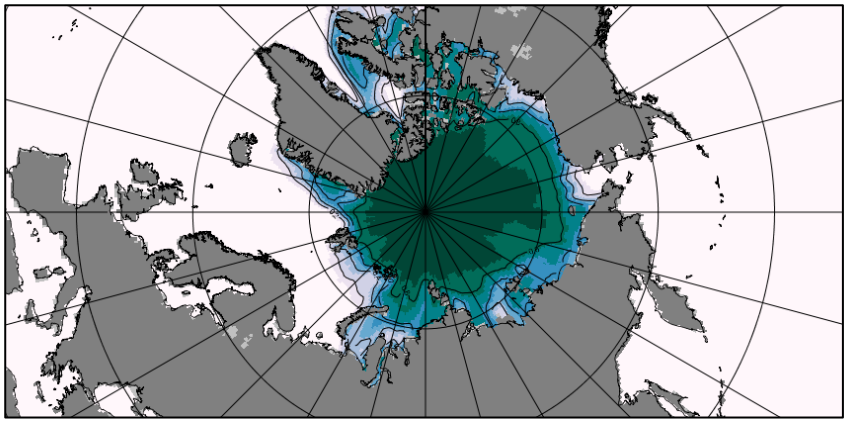
Ice concentration in the Arctic Ocean

1980 – 1990

January

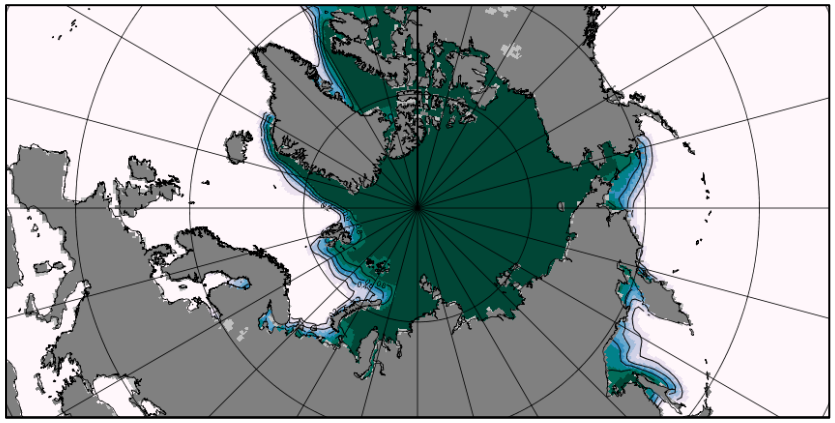


July



2000 – 2012

January



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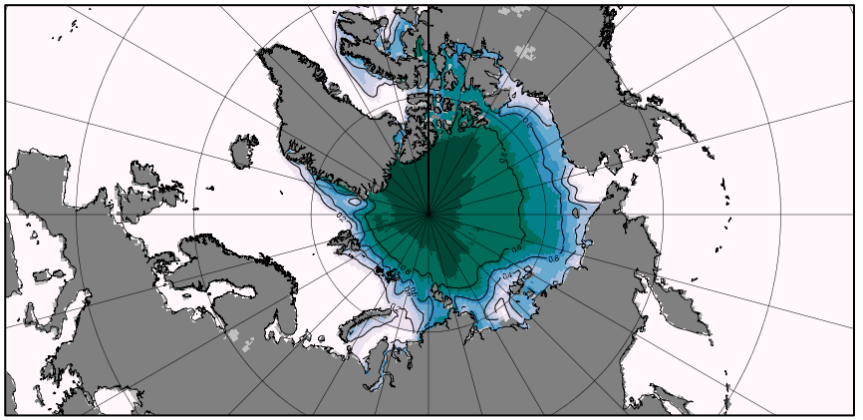
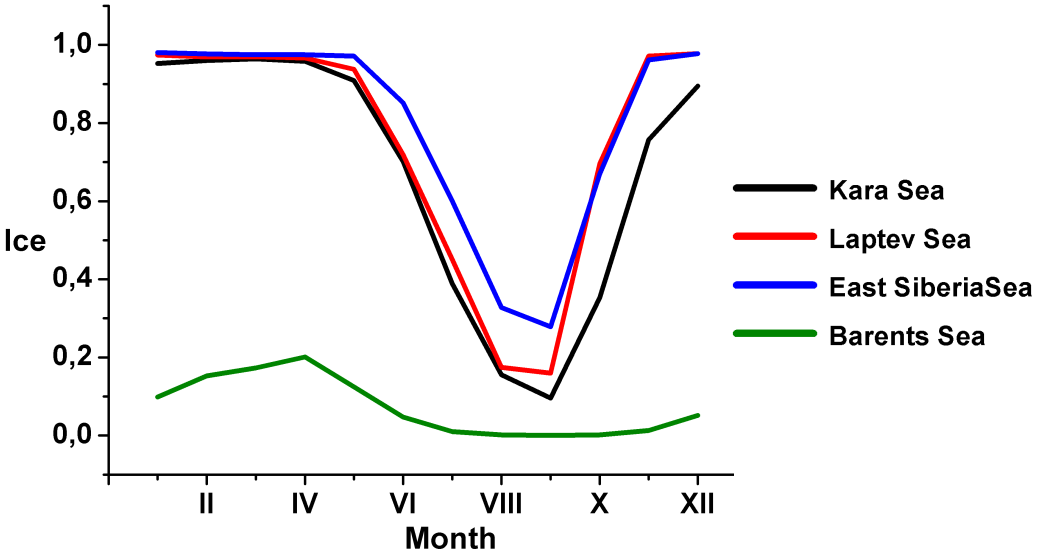


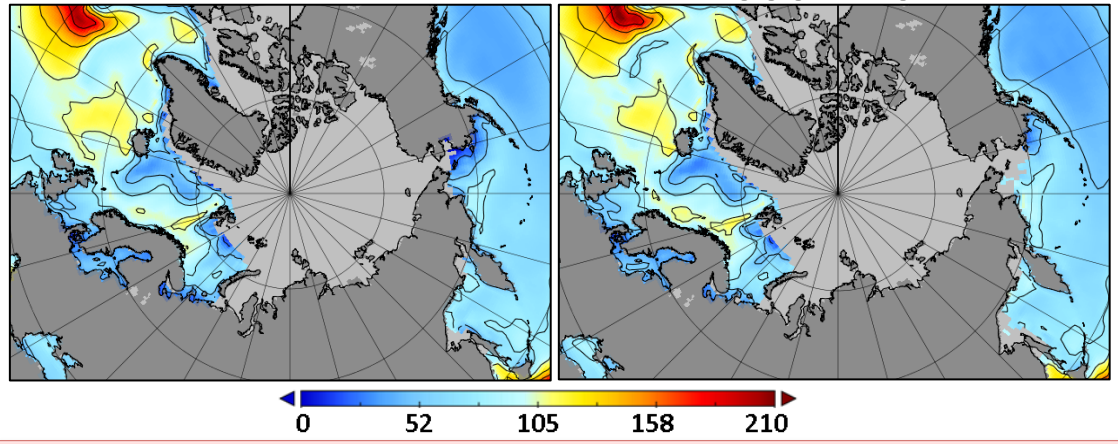
Investigated region in the Arctic Ocean



Annual variability of ice concentration in the Arctic shelf seas

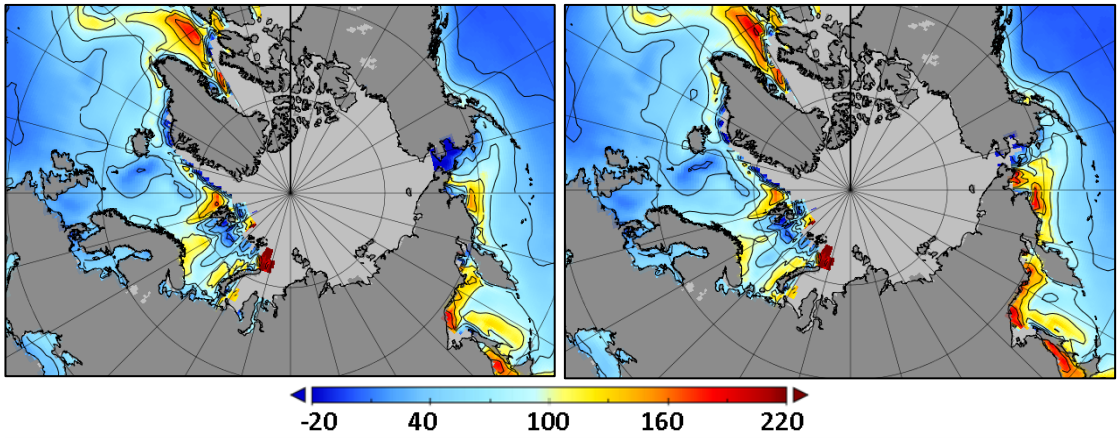
January

1979 - 2012 | 2000 – 2012



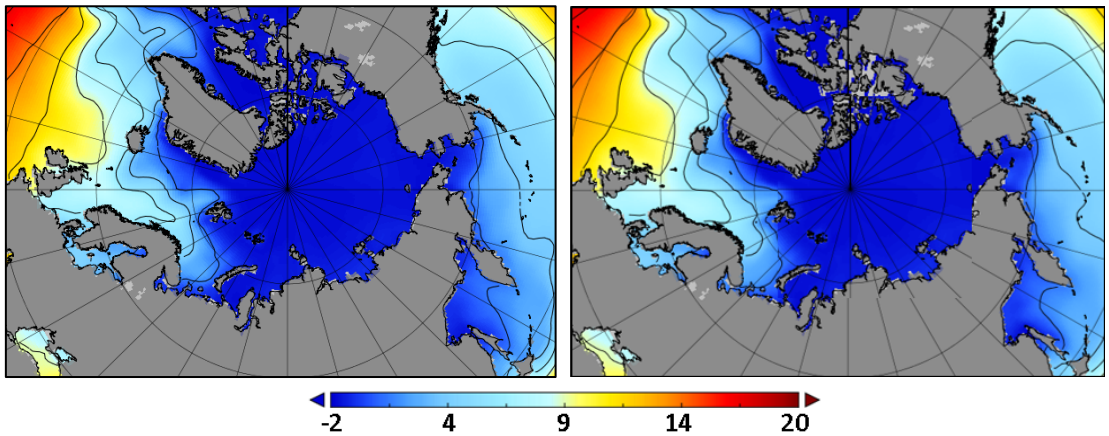
Latent heat flux

LE, W/m²



Sensible heat flux

S, W/m²



Sea surface temperature

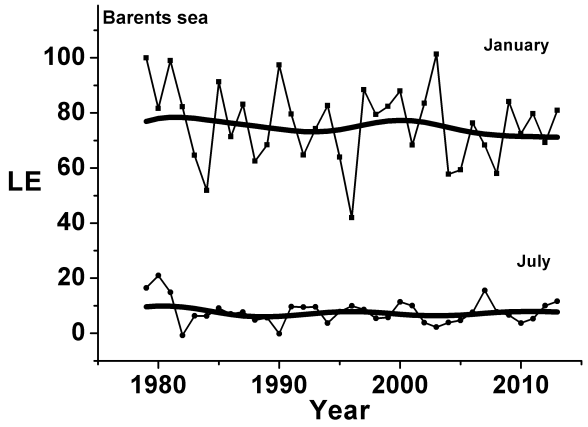
SST, ˚C

The temporal variability of heat characteristics in the Barents sea

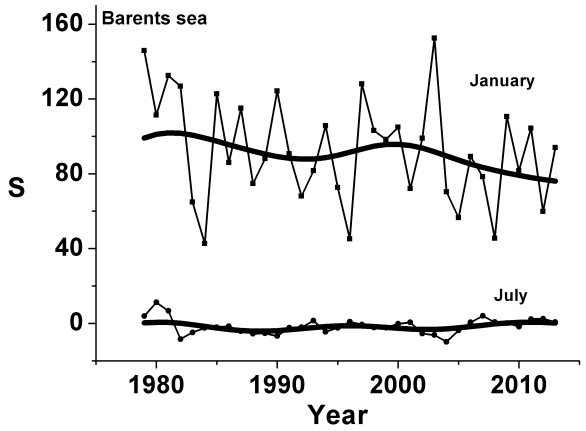
$$S = c_p \, a \, u \, \Delta T$$

$$LE = L \, a \, u \Delta q$$

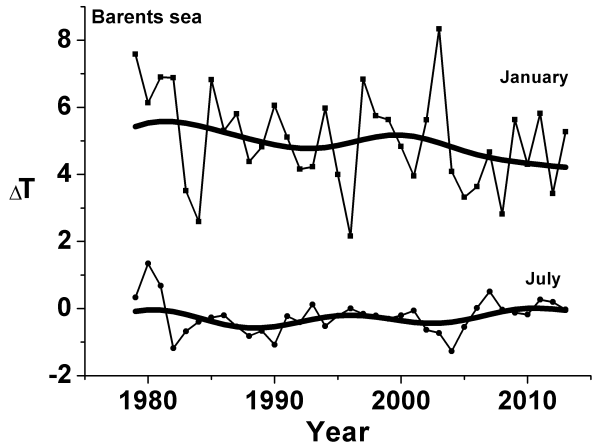
Latent heat flux



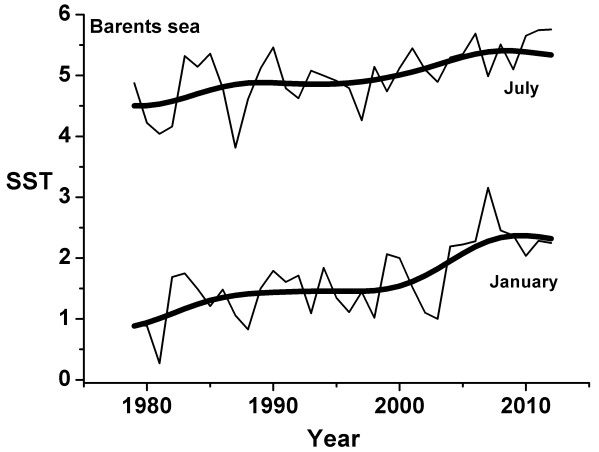
Sensible heat flux



The temperature difference between the ocean and atmosphere



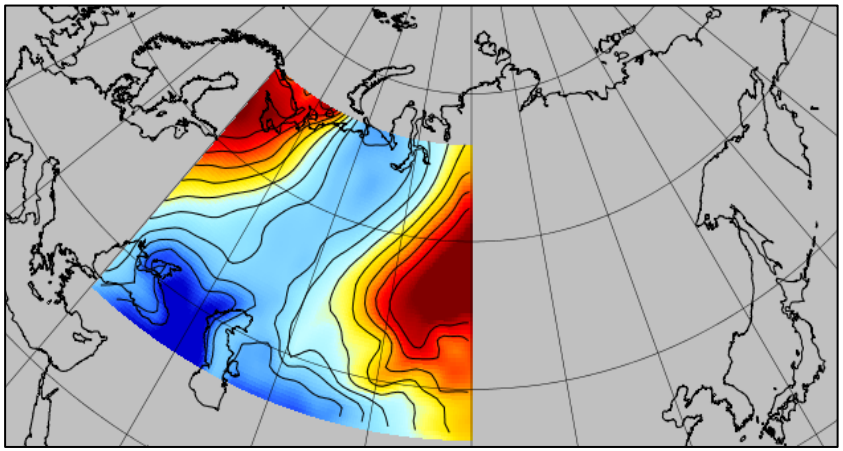
Sea surface temperature



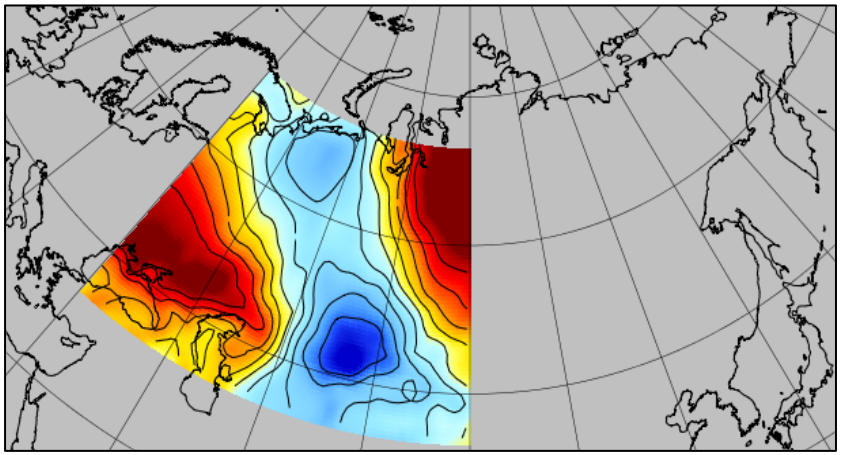
Selection of regions over the North Eurasia

EOF 4

January



July



1958 – 2014

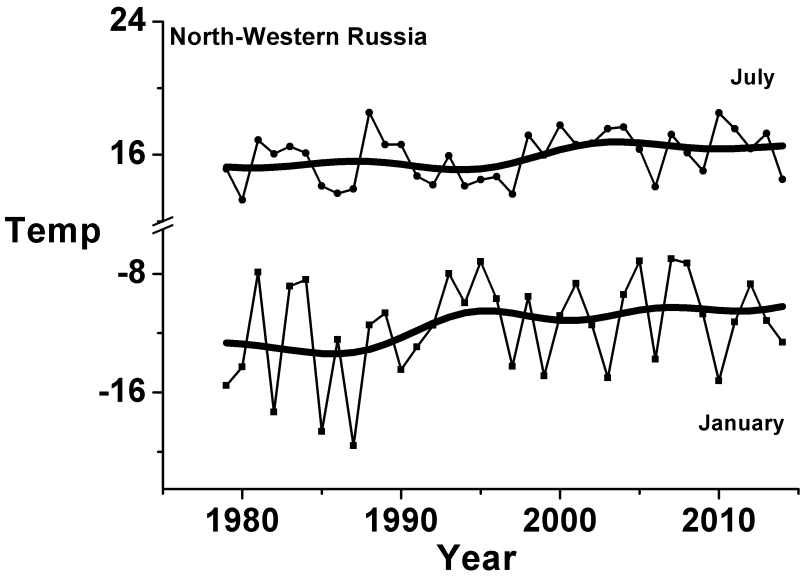
σ =13%

The region of investigated over the North Eurasia

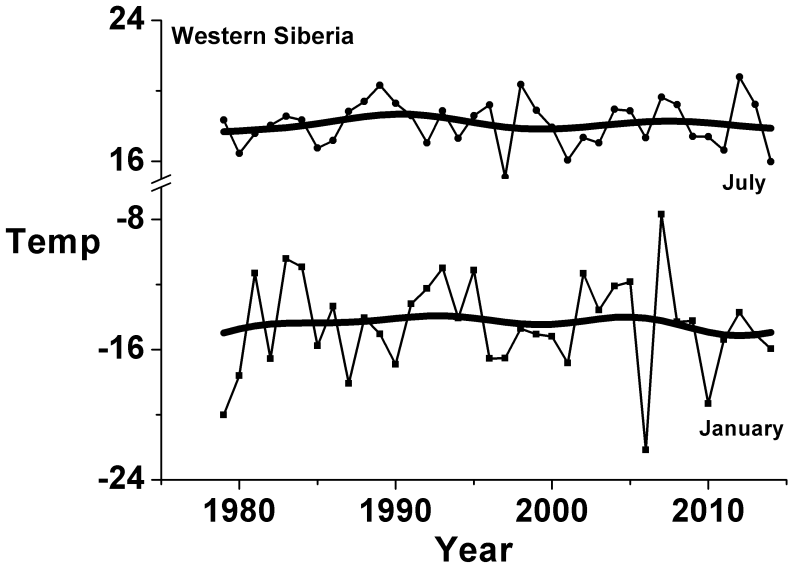
1 – North-Western Russia
2 – Western Siberia

The temporal variability of air temperature over the North Eurasia

North-Western Russia

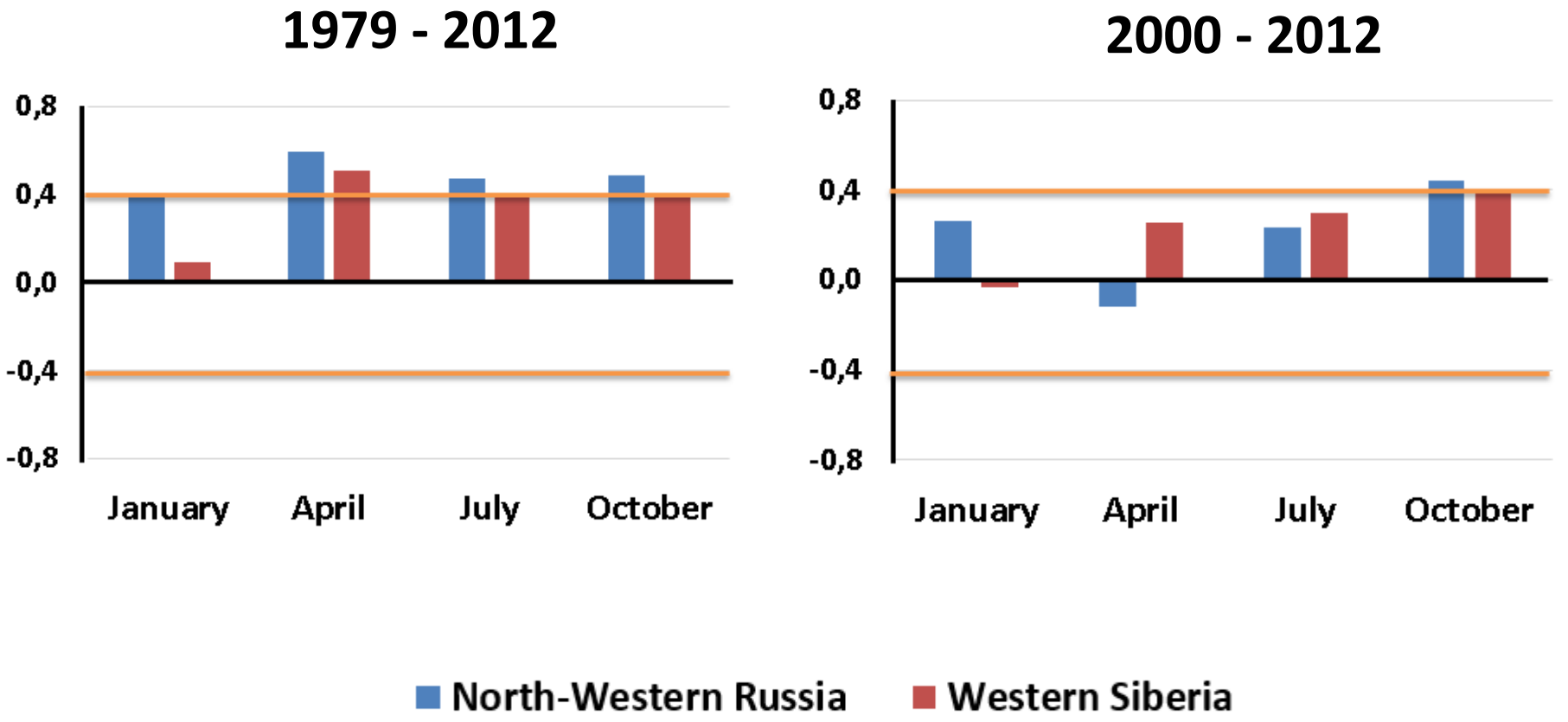


Western Siberia



Seasonal features of correlations

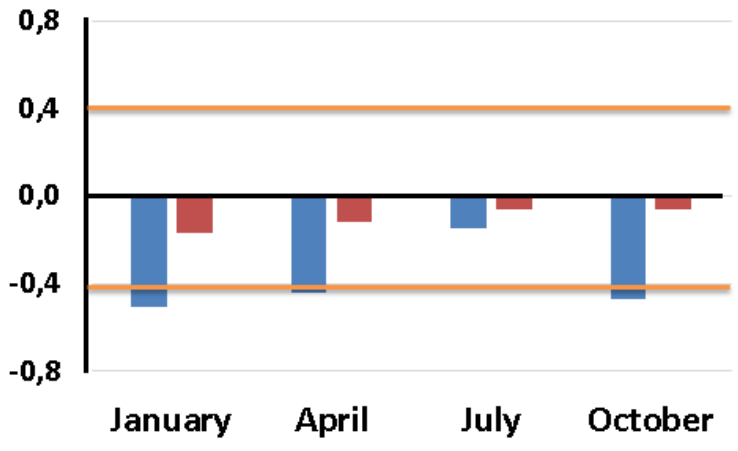
R(SST, Temp)

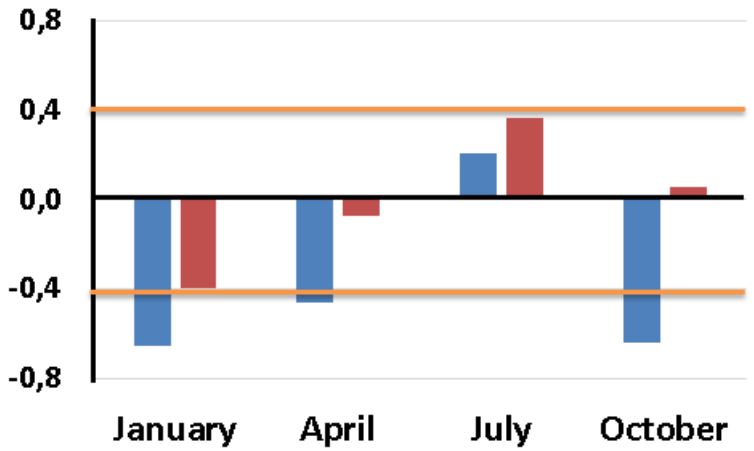


R > 0,4
R < -0,4

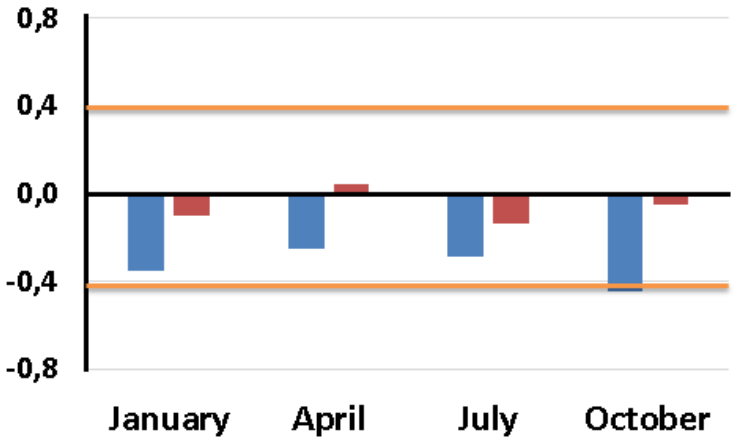
- significant correlations (0,05)

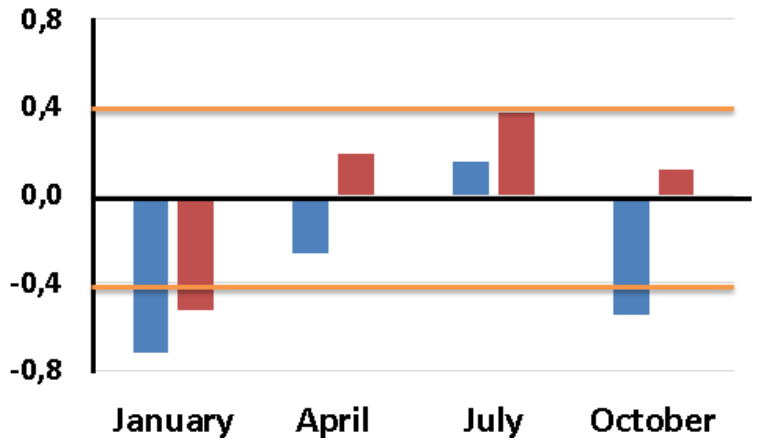
R(S, Temp)





R(LE, Temp)

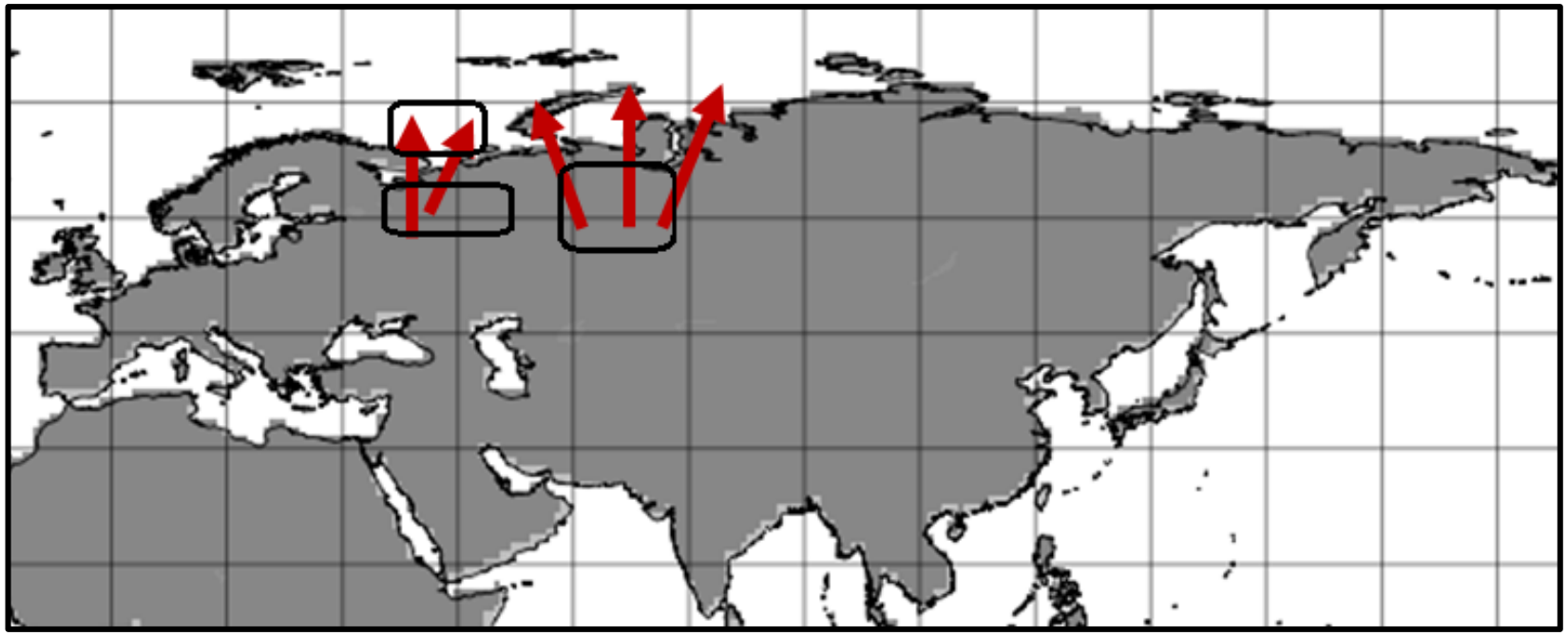




North-Western Russia Western Siberia

R > 0,4
R < -0,4 - significant correlations (0,05)

Dominated advection of air masses for the period of 2000 – 2012 in January



Conclusions

- **In winter, the heat fluxes in the Barents sea are decreased during the last decade. In summer, the heat fluxes are increased due to intensive melting ice;**

- **The maximum correlations are observed between the heat characteristics in the Barents sea and air temperature over the North-Western Russia;**

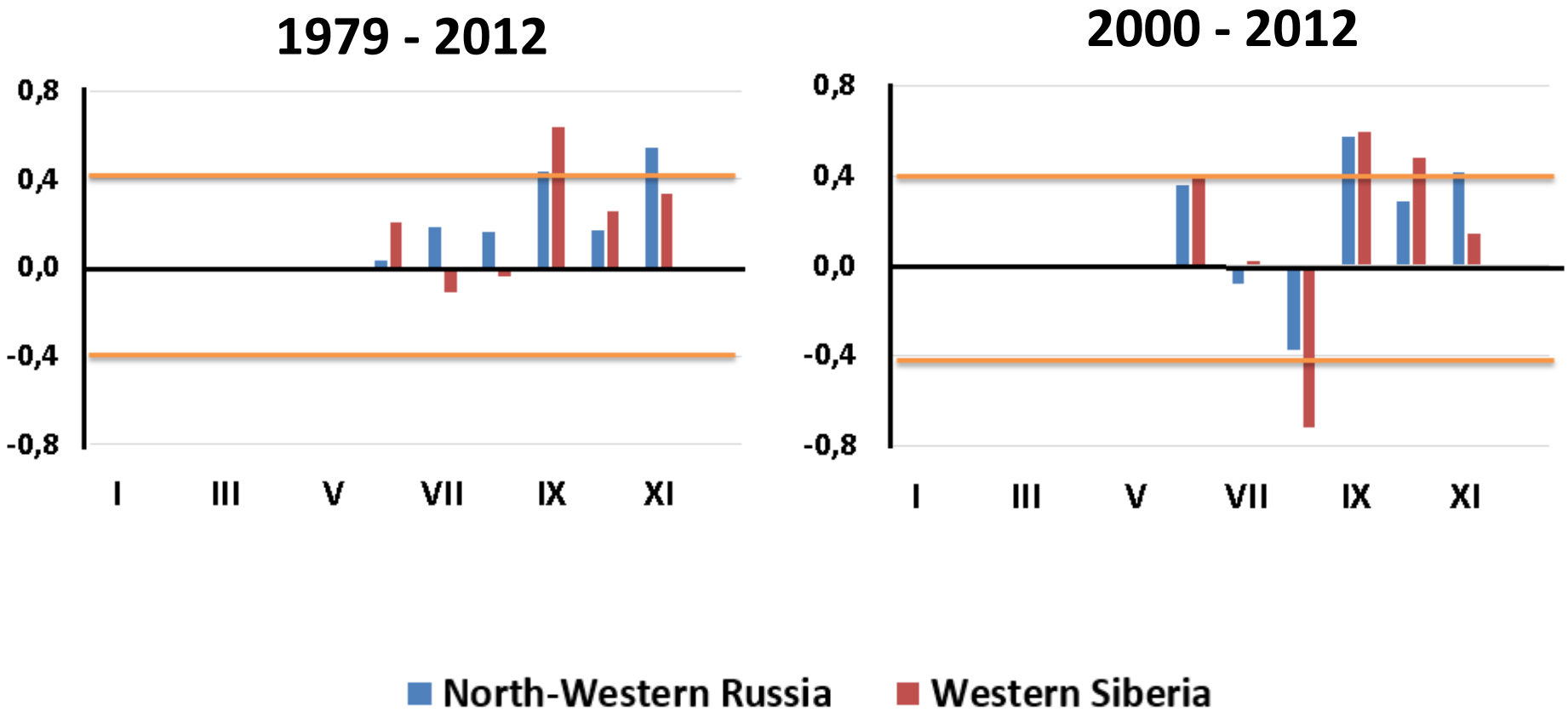
- **The negative correlation are due to dominated advection of air masses from the continent to the ocean during the last decade.**

Thank you for your attention

Kara Sea

Seasonal features of correlations

R(SST, Temp)

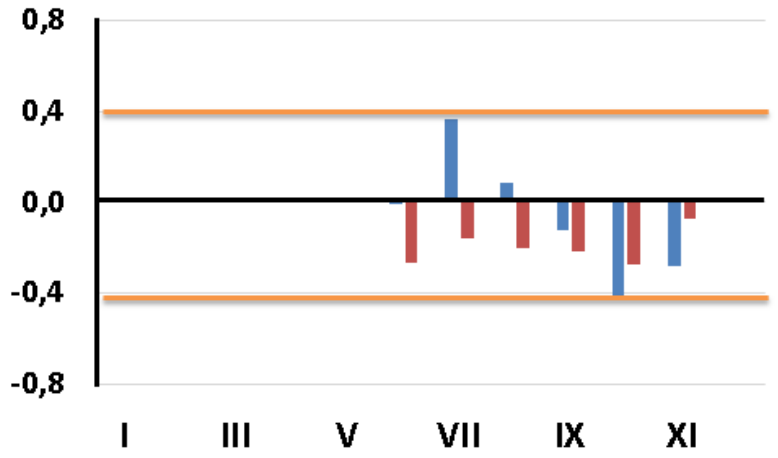


R > 0,4
R < -0,4 - significant correlations (0,05)

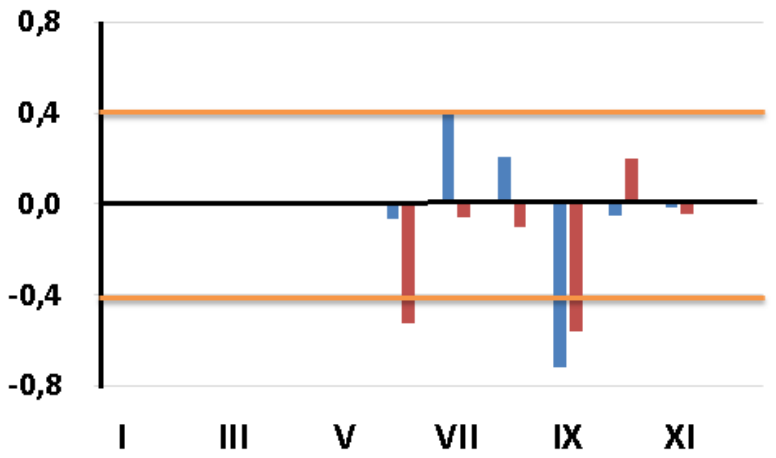
Kara Sea

R(S, Temp)

1979 - 2012

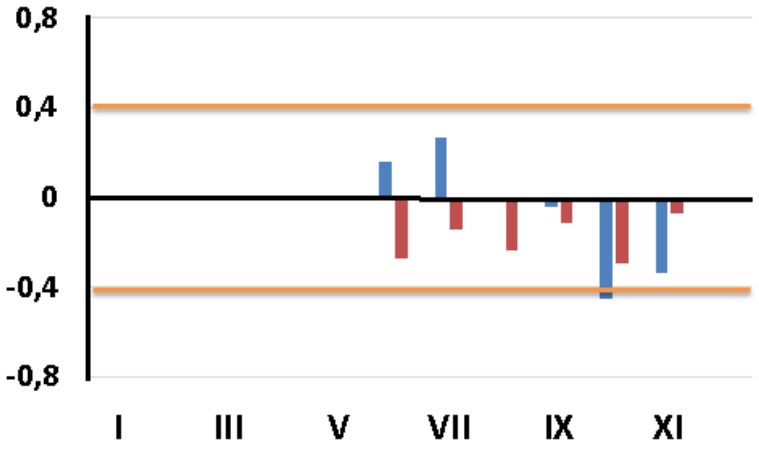


2000 - 2012

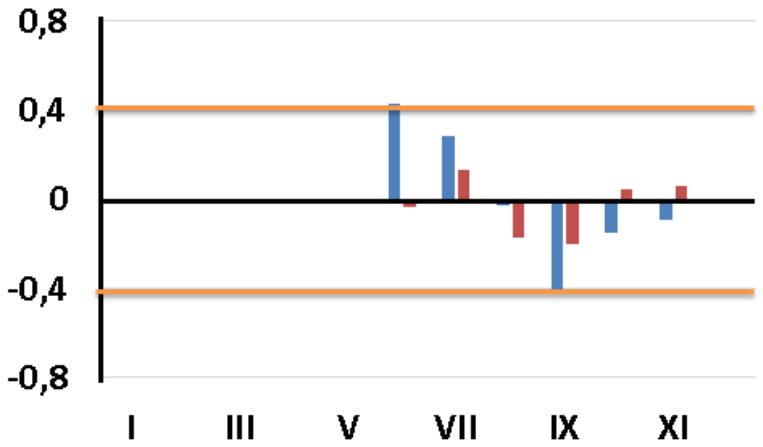


R(LE, Temp)

1979 - 2012



2000 - 2012



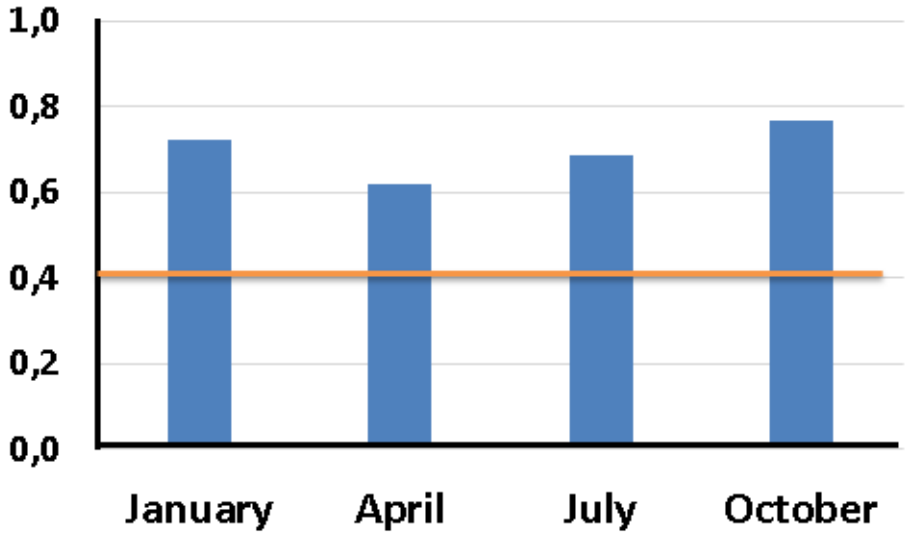
North-Western Russia Western Siberia

R > 0,4
R < -0,4 - significant correlations (0,05)

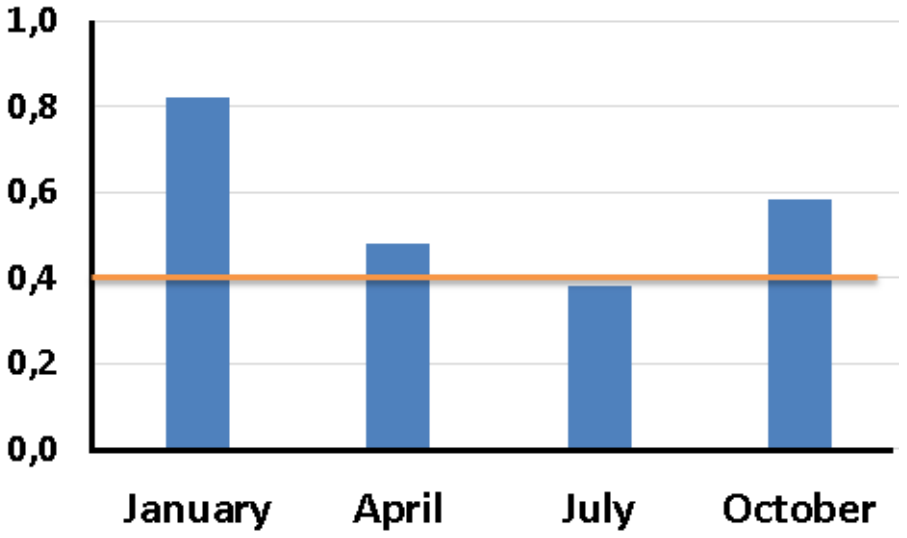
Seasonal features of correlations

R(Temp North-Western Russia, Temp Western Siberia)

1979 - 2012



2000 - 2012



R > 0,4 - значимые корреляции по уровню значимости 0,05